Project to Re-Create Basic Program Used to Calculate Stock Mutual Fund Returns

by

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History

I started investing each month in 3 stock mutual funds in about 1979. At that time, there was no way to calculate the annual rate for the funds.

I had written several programs in FORTRAN when I was an engineering student at the U of Illinois between 1974 and 1978.

I Was an "Early Adopter" of the First Personal Computers

Texas Instruments introduced a personal computer in June 1981 called the TI-99/4A, which I bought. Then the Commodore 64 was introduced in August of 1982, and I bought it.

On the TI computer, you had to record data on a cassette tape. The Commodore 64 used a 5.25 inch floppy drive.

I decided to write a program to calculate the compounded annual return of each of my mutual funds, then run the program on the Commodore 64. I learned how to write a Basic program, because it was fairly similar to FORTRAN.

I started investing in mutual funds in 1979, and I typically added some money to each of 3 funds monthly. So by 1985, each fund likely had about 72 transactions assuming monthly investments for 6 years.

How Long to run the Basic Program for each of the 3 Mutual funds circa 1985?

I don’t remember which computer it was, but I think it took 10 or 15 minutes to arrive at the equivalent annual rate of compounded return for each of the 3 funds!!! There were only likely 50 to 100 transactions per fund to analyze. I don’t remember how many iterations it took to hone in on the final answer return rate.

A modern Quicken software program can do this calculation in about 1 second or less, not 15 minutes!!!

Basic Program

So, for input data, I kept a handwritten log book of the date and the amount I invested in each mutual fund. The key data was the investment date and the amount invested.

I had no withdrawals of cash from the funds, so that was not a factor in calculating the annual return.

I also knew the ending or current value of each mutual fund for a given date.

For each investment date, I would calculate the number of elapsed days from the date of the investment until today’s date.

I started with a guess of 10% annual return for each fund, as a starting point.

I could not use an average annual return rate because I was dealing with days not years. I can't remember for sure how I did this calculation since it was about 40 years ago.

I think I used FV = PV(1+i)^(n/365) with i being the annual rate and n being days. If I used this method, I just confirmed recently that this is correct.

One could also convert the annual rate to a daily rate instead of an annual rate.....

PV = FV(1+i)^(n) with i being the daily rate.

It is tricky to calculate the daily compounded rate correctly. I have done work on this and found the correct conversion is:

$I_{daily} = (1 + I_{annual})^{(1/365)} - 1$

I checked recently and you can use annual or daily return rates, since the annual rate formula is easier, I set up an Excel Spreadsheet on august 30, 2025, and used the annual rate:

Excel version of my Basic Program for Calculating Annual Compounded Return of my Investments - last updated 08-30-2025.xls

Process to Hone in on Actual Equivalent Compounded Return Rate

- Guess at starting equivalent portfolio average return rate of 10%
- For original investment:
  - Using today's date, calculate number of days since Year 0
  - Calculate number of days since Year 0 when money was invested
  - Subtract the two and get the elapsed number of days the money has been invested
  - Calculate the present value of the investment using the initial 10% guess rate
- Repeat this for each investment made in the fund
- Add up all the present values and calculate today's portfolio value using the 10% guess rate
- To get the next trial annual return rate, use the ratio method
  - Trial rate = (.10/calculated portfolio)*(actual portfolio value)
- Using the new trial rate, repeat the process above and get a new calculated portfolio value
- Continue to generate new trial rates using the Ratio Method until you get within $1 of the actual portfolio value

Excel File Re-Creation of the Basic Program process

My test Excel file only has 10 transactions, not 50 to 100 transactions like I had back circa 1985. It took 6 iterations to get the calculated ending portfolio value within $1 of the actual portfolio ending value.

Iteration #	Annual Return Rate	Ending Portfolio Value [target = $35,000]	Guess minus Target	Guess minus Target %
1	10.000000%	$28,839	-$6,161	-17.60%
2	12.136368%	$35,618	$618	1.77%
3	11.925871%	$34,890	-$110	-0.31%
4	11.963500%	$35,019	$19	0.05%
5	11.957005%	$34,997	-$3	-0.01%
6	11.958133%	$35,001	$1	0.00%

Excel Built-In Solver Function

Excel has a built in function which uses trial & error to find the X variable which gives the Y answer you want. I made a new tab in the Excel spreadsheet and ran this function. There is an option to turn on a viewer which stops the program at each iteration, and it took 5 steps to get the answer, in less than 1 second !!

Interesting that the Solve function 5 iterations was not much different than the 6 iterations my method took.

Would Using a Y = MX + B Method take less iterations to solve?

When you use the 10% initial guess return rate, you get a resultant calculated ending portfolio value.

You can use the simple ratio method to get the 2nd rate, and then get that calculated ending portfolio value.

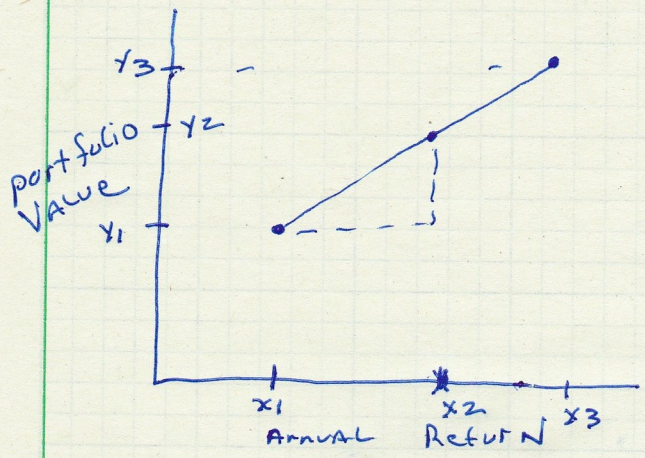
Now you have X1, Y1, X2, and Y2, or two points of a line. You can use the y = mx + b formula to find the equation of that line. To get the 3rd guess, you use that formula to solve for X or the rate that will give you the ending portfolio value you want.

If the 3rd trial rate is not close enough, then use your last 2 data points to calculate a new equation for the line, and then solve to get the 4th trial rate.

I believe this method would result in less iterations than the simple Ratio Method.

D.C. MACey

Aug 30, 2025



$y = mx + b$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$x_1 = .10$

$y_1 = 28,839$

$x_2 = .1214$

$y_2 = 35,618$

$m = \frac{35,618 - 28,839}{.1214 - .10} \Rightarrow 316,776$

$y = mx + b \Rightarrow b = y - mx$

$x_1 = .10 \quad y_1 = 28,839$

$b = 28,839 - .10(316,776)$

$b = -2839$

$y = mx + b$

$x = \frac{y - b}{m}$ $\frac{35,000 - (-2839)}{316,776} = .11945$

gives $35,000 !!

Actual Solution = .11958133

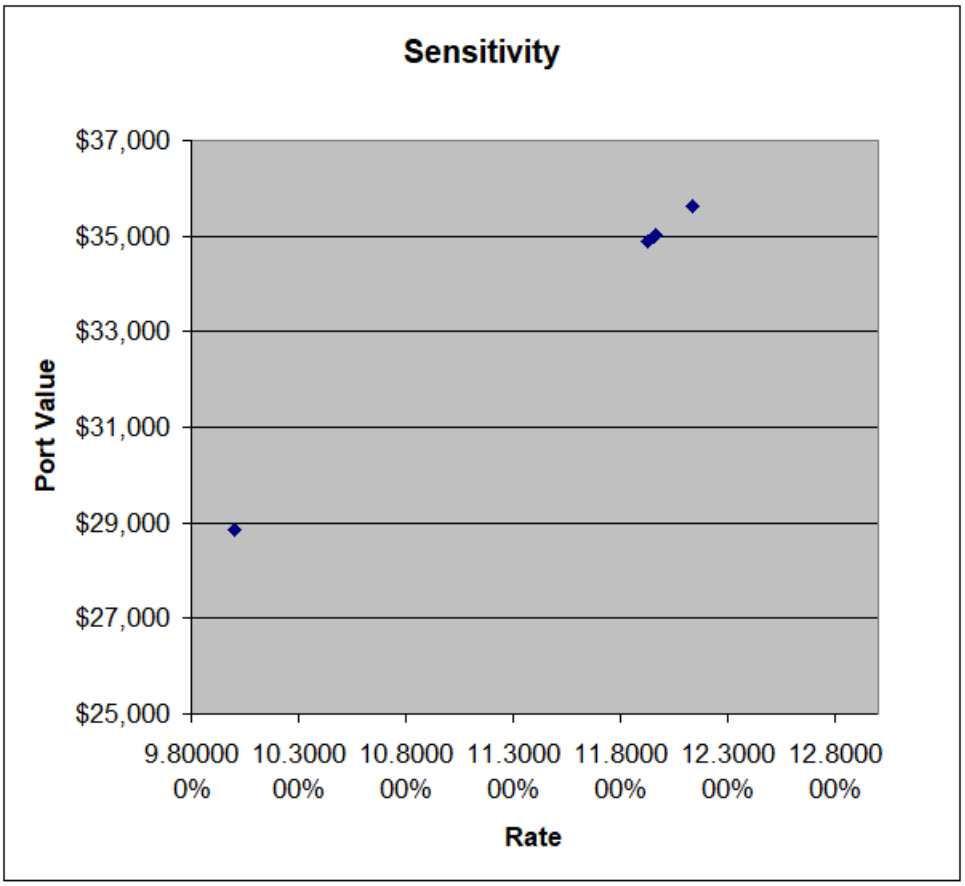
Next, do same math on last 2 guesses

I can’t remember for sure, but I think I did use the Y = mx + b method back circa 1985 in the basic program.

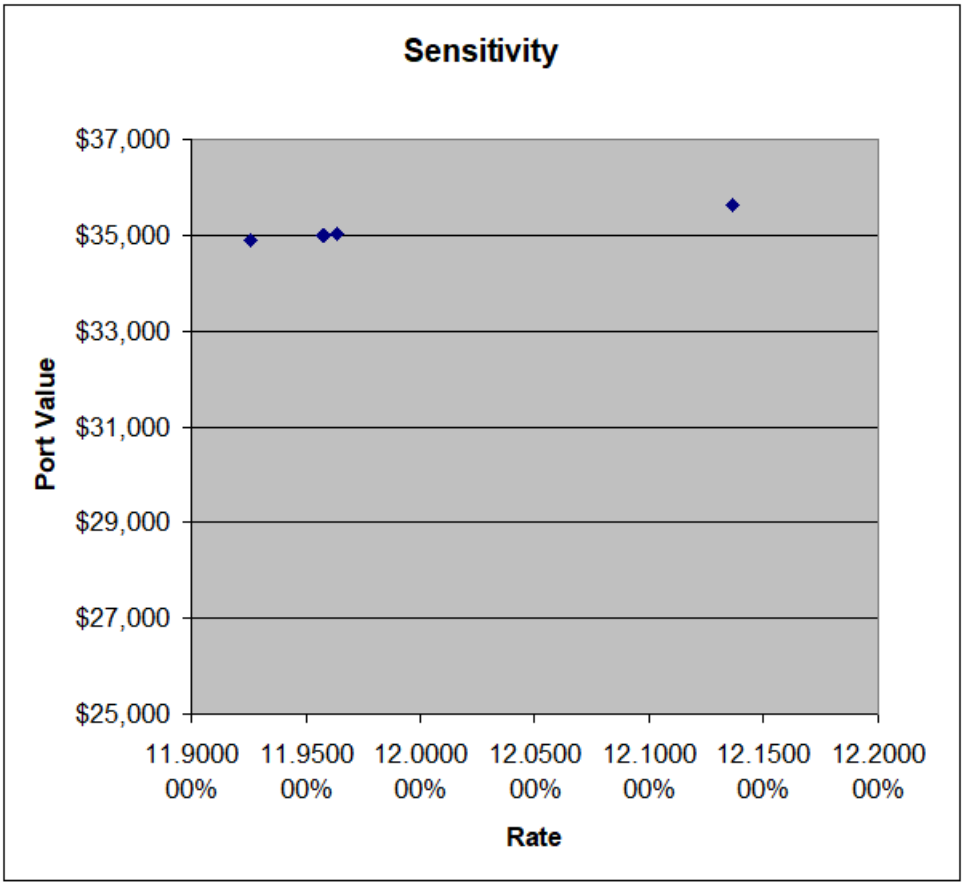
Without a lot of time, I could create a case of using 72 transactions (6 years x 1 transaction per month) and see if the number of iterations increases dramatically or not.

Sensitivity of Ending Portfolio Value Versus Return Rate

From my Excel File……..



For a 10 transaction portfolio, the relationship looks pretty linear. What if we zoom in by ignoring the 10% initial guess rate?



Still relatively linear relationship near the final solution return rate.

Will the Ratio Method work for a Mutual Fund with about 72 transactions?

If I made an addition to each fund monthly, over about 6 years from 1979 to 1985, that would be 6 years x 12 months/ year = 72 transactions.

I created a new tab in the same Excel file as noted above, and created a test portfolio of 72 transactions that took place way back in 1979 to 1985.

I started using the same ratio method each time to guess at a new return rate, and things went haywire!!!!!

OOOPS - This is not going well !!				
Trial Rate	Calculated Portofolio Value	Actual Port	Calculated minus Actual Port	Percent error
10.00%	$2,818,735	$3,200,000	-$381,265	-11.91%
11.35%	$4,893,896	$3,200,000	$1,693,896	52.93%
7.42%	$967,584	$3,200,000	-$2,232,416	-69.76%
24.55%	$778,078,354	$3,200,000	$774,878,354	24214.95%
solver says answer is 10.31%				
What is going wrong?				

Turns out I can not use the simple ratio method to get the new guess at the return rate because the large portfolio is too sensitive to changes in the return rate!!

Portfolio amounts are very large because of 42 years of compounding interest, so too sensitive to use the ratio method !!

so try using equation for a line after you get the first 2 data points

too sensitive: $ change for 1% rate difference ==== $153,418,910

The simple 10 transaction portfolio was not near as sensitive and it worked OK.

Try the Equation of a Line Method on the 72 Transaction Portfolio

- I got the calculated portfolio value for the starting 10% return rate.
- I used the ratio method to get the next trial return rate
  10%/(portfolio value at 10%) * Target portfolio value
- I got the calculated portfolio value using this trial rate

- To get the 3rd trial rate, I calculated the equation of the line given the first two trial rates and their resultant calculated portfolio values.
  - Then using that y = mx + b formula, I solved for the next trial rate that would result in the desired target value

- For the 4th trial rate, I re-calculated the line that fit the 2nd and 3rd trial rates.
- For the 5th trial rate, I re-calculated the line that fit the 3rd and 4th trial rates
- For the 6th trial rate, I re-calculated the line that fit the 4th and 5th trial rates

Trial Rate	Calculated Portfolio	Actual Port	Calc minus actual port	% error
0.1	$2,818,735	$3,200,000	-$381,265	-11.91%
11.35%	$4,893,896	$3,200,000	$1,693,896	52.93%
10.24851%	$3,120,947	$3,200,000	-$79,053	-2.47%
10.29774%	$3,184,472	$3,200,000	-$15,528	-0.49%
10.30978%	$3,200,191	$3,200,000	$191	0.01%
10.30963%	$3,200,000	$3,200,000	$0	0.00%

So, it took 6 iterations to get the calculate portfolio value within $1 of the actual portfolio value.

This exercise kind of indicates I must have use this method when I wrote the Basic program circa 1985, because the program would have never found an answer if I used the ratio method.

The Excel Solve function took 4 iterations and gave a result of 10.30963%, the same result I got with my method !!

Basic Program

So this last method where I guessed at a starting rate of 10%, used the ratio method to get the 2nd guess rate and then resultant calculated portfolio, then used y = mx + b method to hone in on the answer should have all been very doable for me to write in my Basic program.

The transactions were in the back of the file, and I think you have to make the last date entry with 0 values for the do loop to quit reading the data.

Why did I spend time on this project?

Back circa 1985, there was not way to calculate the annual compounded return of a portfolio. I started investing in 1979 in 3 different stock mutual fund portfolios and a few years, I want to compare their performance, but I had not way to do it.

I wrote several complex FORTRAN programs in the 1976 to 1978 time frame at the University of Illinois for various engineering classes. The program steps were punched onto computer cards that formed a deck of cards that ran on an IBM 360 main frame computer.

One program was written for a hog house and the objective was to see how large of ventilation fans should be installed and if any additional heat was required. We simulated the weather year round by assuming the temperature followed a sinusoidal pattern with max temps in the summer months and the minimum in the winter months. For each day of the year, we used a random number generator to vary the temp each day within limits. We could then run the simulation model for 10 years and see how the building design worked. We could exercise some judgment and not install heating systems, but in the unlikely event of several super cold days, we could rent and apply auxiliary heat just for those days.

I also wrote a program which predicted when an agricultural tractor might flip over backwards pulling an implement going up a hill.

So, I was used to writing programs by the time I decided to write a program which would give me the calculated returns of my mutual fund investments. Switching from FORTRAN to Basic was not very difficult as I remember since they were similar.

It was fascinating to me to wait 10 or 15 minutes for the Commodore 64 or Texas Instruments computer to sit there and run and run until the program finally finished !!!!!!!

I plan on uploading this document and the associated spreadsheet to Archive. Org. Maybe many generations from now, one of my great-great grandchildren will do some genealogy research and discover this exercise I did!

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